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ASPEN

. . . an American wood

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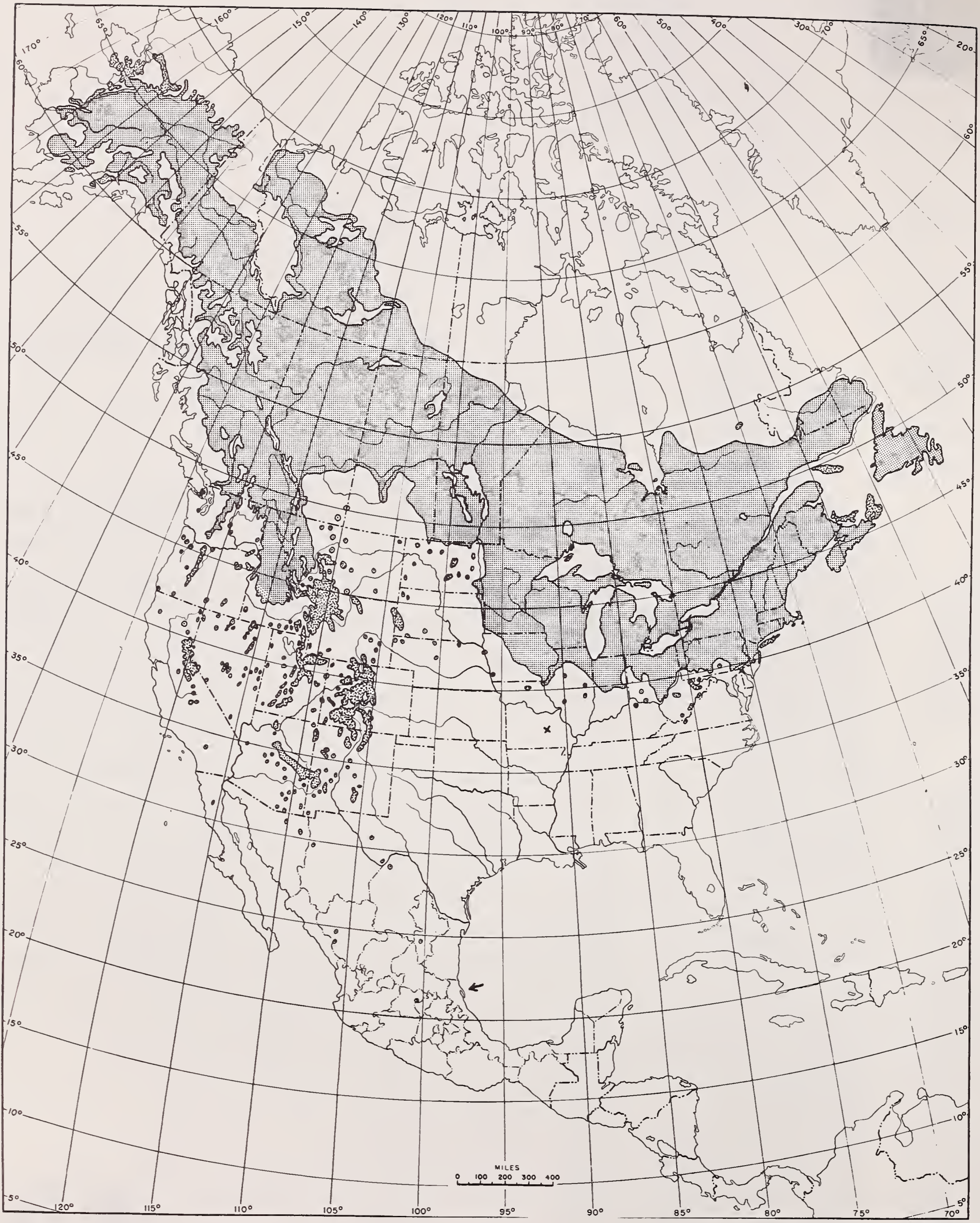
Aspen, the most widely distributed tree species in North America, is one of the softer and lighter-weight commercial hardwoods of the United States. The largest volumes of aspen are used in manufacture of pulp products such as book and specialty papers, newsprint, and insulation board. The wood is light in color, straight-grained, finely textured, and odorless and tasteless when dried. It resists splitting when nailed, has excellent nail holding ability, and is free from slivers, making it ideal for furniture parts and interior trim, as well as boxes, crating pallets, and lumber core stock. Smaller volumes are used for excelsior, particleboard, paper, roll plugs, and turned products.

FS–217
February 1973
U.S. Department of Agriculture Forest Service



F-506640

Figure 1.—Natural range of quaking aspen.

COVER: F-521192

ASPEN

. . . an American wood

(*Populus tremuloides* Michx. and *P. grandidentata* Michx.)

John R. Jones and Donald C. Markstrom[1]

DISTRIBUTION

Two species of aspen grow in North America, quaking and bigtooth. Where their ranges overlap, both species may be present in the same stand. Often, aspen stands contain fir, spruce, paper birch, or other species.

Quaking aspen, the most widely distributed tree species in North America (fig. 1) ranges from Alaska through Canada and into the northeastern and western United States. In the West it occurs as far south as central Mexico at elevations where moisture is adequate and summers sufficiently cool. The more restricted range of bigtooth aspen (fig. 2) includes southern Canada and the northern United States, from the Atlantic Coast westward to the prairies.

Six of the United States have more than a million acres of aspen stands on commercial forest land:[2]

State	*Acres*
Minnesota	5, 451, 000
Michigan	4, 799, 000
Wisconsin	4, 611, 000
Colorado	2, 794, 000
Alaska	2, 407, 000
Utah	1, 280, 000

In Minnesota, Michigan, Wisconsin, and Utah, aspen stands occupy more land than any other forest type, and very large acreages are found in Canada, especially the central portion.

Aspen trees commonly occur in other forest types too. Usually an element in the spruce-fir forests of central Canada and the Lake States, aspen sometimes appear in stands of northern hardwoods. Well-stocked stands of mixed jack pine and aspen are found on the Pre-Cambrian shield in Canada and Minnesota. Scattered aspen groves and individual trees are often seen in the Engelmann spruce-subalpine fir forests of the Rocky Mountains, and are frequent in the mixed conifer forests of New Mexico and Arizona. In the Western States, scrubby aspen, surrounded by oak brush or sagebrush, are found below the forest zone, and prostrate aspen occasionally appear in the flattened mats of tree-shrubs above timberline.

DESCRIPTION AND GROWTH

Aspen trunks usually are fairly straight, have little taper, and are clear of limbs over much of their length; but limb scars do persist (cover photo). In some stands, however, aspen trees are very crooked, even contorted, usually from genetic causes.

Bark characteristics of the two species vary. Bigtooth aspen bark (fig. 3) is brownish or yellowish green, and becomes furrowed on the lower trunks of larger trees. In Canada and the eastern United States, quaking aspen bark varies from chalky white to green or olive green, and becomes furrowed on the lower trunks of large trees. In the Western States, however, the bark sometimes may be yellow brown, but ordinarily is not furrowed even on the largest trees.

Aspen leaves (fig. 4) vary from broadly ovate to nearly round, with slender flattened petioles that cause them to flutter in the slightest breeze. Quaking aspen leaves are from 1¼ to 3 inches wide and lustrous dark green: their margins have small rounded teeth. Bigtooth aspen leaves are typically larger, and a lighter,

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[1] Forest ecologist and associate wood technologist, respectively, Rocky Mountain Forest and Range Experiment Station. USDA Forest Service, in cooperation with Colorado State University.

[2] Land capable of producing industrial wood and not withdrawn from cutting by law or regulation. Estimated acreages taken from forest surveys made by Intermountain, North Central, Northeastern, and Pacific Northwest Forest Experiment Stations, USDA Forest Service.

NOTE: This publication supersedes "Aspen," unnumbered, issued 1945.

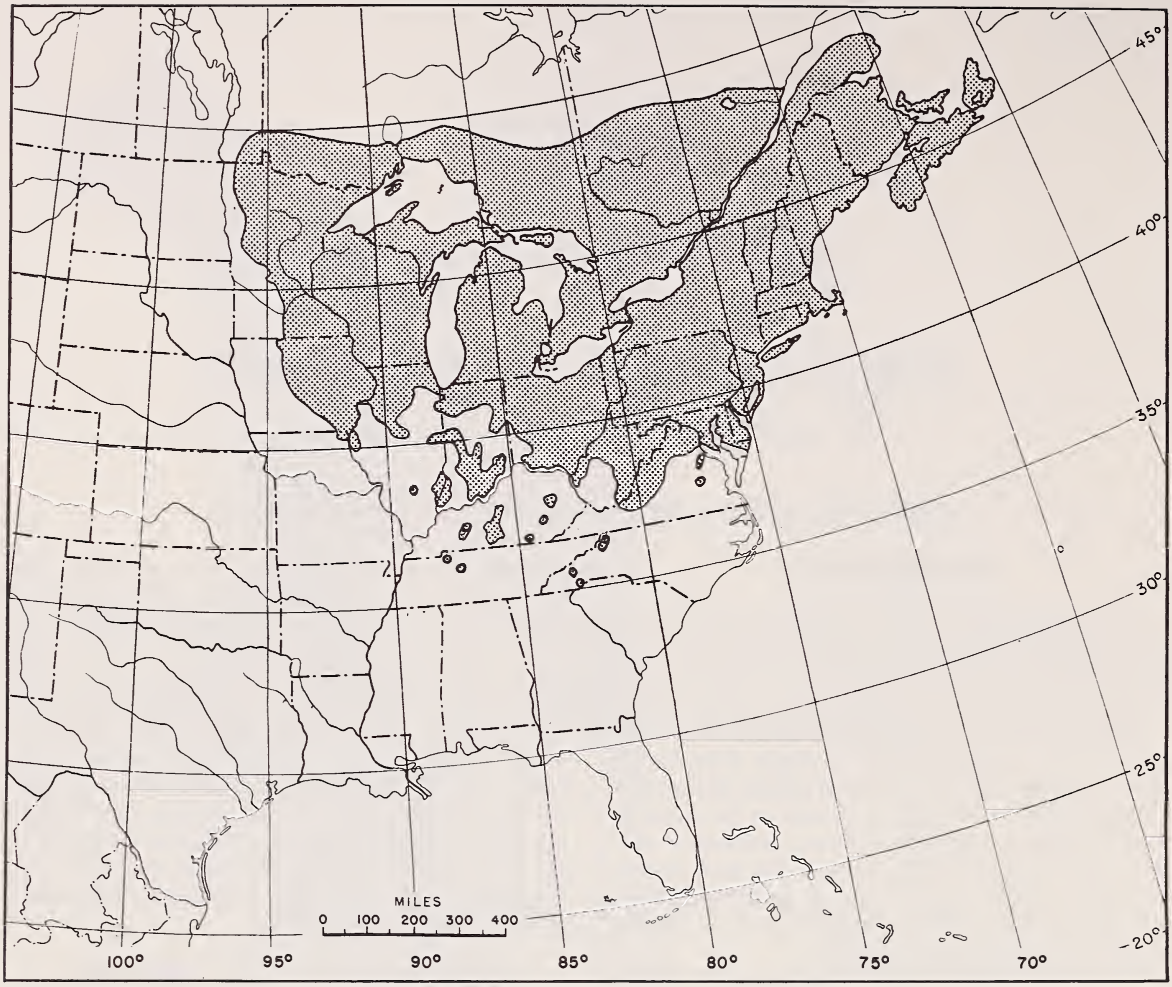

Figure 2.—Natural range of bigtooth aspen. F–506638

duller green; their margins have larger less rounded teeth. In both species the leaves of young suckers are atypical, and as long as 7 to 8 inches.

Roots usually are abundant in the top 2 to 3 feet of soil. Below this, vertical 'sinker' roots often extend to depths of 5 feet or more, where they penetrate even very hard soil layers.

Seeds are tufted, and average more than 3 million per pound. Occasionally some female trees produce very abundant seed. Since the newly germinated seedlings require optimum conditions to survive, most new aspen trees originate as sprouts from the widespread roots of older trees.

Aspen stands consist of a mosaic of clones. Each clone is a group of genetically identical trees descended by root suckering from a single common parent often generations removed. In Michigan, single clones frequently cover 0.1 to 0.2 acre and may exceed an acre. In the Rocky Mountains, a single clone may occupy several acres.

Aspen, intolerant of overhead shade, normally does not grow beneath a canopy of larger trees. Beneath the open canopy of an old deteriorating aspen stand, however, suckers may persist and grow slowly.

The aspens are shorter lived than most associated species. In the Lake States, aspen stands commonly break up by age 60.

In the Rocky Mountains, 100-year-old stands are common, and some 200-year-old stands are found.

Pure stands of aspen usually become established only after fire or logging. Other species often replace them in a single generation, but in the Western States, aspen stands may persist through several generations, or even indefinitely, because seed sources of other species are distant or because the environment is only occasionally suitable for their establishment.

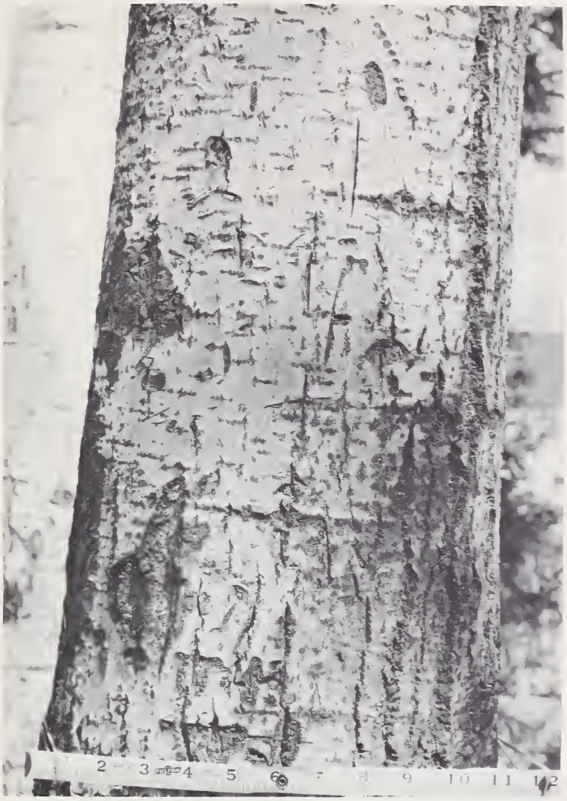

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Figure 3.—Bigtooth aspen bark.

On medium or better quality sites throughout most of its range, aspen grows more rapidly than associated species, at least during the first few decades of life. In eastern United States, suckers may exceed breast height the first growing season. Two instances of unusually rapid growth are (1) a Michigan plot where dominant bigtooth aspen averaged 110 feet tall at age 54, and (2) a Minnesota plot where dominant quaking aspen averaged 82 feet tall at age 37. On medium quality sites in the Lake States, dominant trees in 50-year-old stands average 60 feet tall and 8 to 12 inches in diameter at breast height. Growth is slower in central Canada and the Western States, but the trees live longer there and become as large. The Arizona stand in the cover photo took 150 years to grow 110 feet tall. The largest aspen reported, grown in Utah, was 120 feet tall and 4 feet in diameter.

Periodically, epidemics of the forest tent caterpillar defoliate extensive areas of aspen trees in the Lake States. Although few trees die, their growth is temporarily slowed down. A fungus disease, hypoxylon canker, causes most aspen death in the Lakes States. In the Western States, outbreaks of the Great Basin tent caterpillar have wiped out large stands of aspen. Various cankers, however, cause most mortality.

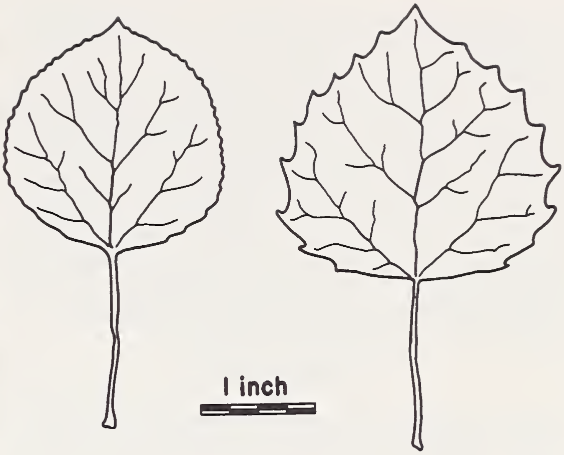

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Figure 4.—Aspen leaves of quaking aspen (left) and bigtooth aspen (right).

In both regions, deer browse young aspen sprouts, and where herds are heavily concentrated, repeated browsing may completely eliminate some sucker stands. In the Lake States, large deer herds have often created an economic problem for the forester or landowner who grows aspen for a commercial market.

COMMON NAMES

P. tremuloides, commonly called quaking aspen, is also known as trembling aspen, aspen, popple, and quaky. *P. grandidentata,* usually called bigtooth aspen, also may be called largetooth aspen and popple. The term popple or sometimes "poplar" should not be confused with yellow poplar (*Liriodendron tulipifera*), also known in the trade as "poplar."

RELATED COMMERCIAL SPECIES

Balm of Gilead (*Populus balsamifera*) is included in the sawtimber and pulpwood volumes shown for quaking and bigtooth aspen. This species occurs with aspen throughout much of the range in the Lake States and Northeast.

SUPPLY

The total stand of both quaking and bigtooth aspen in the United States, is approximately 16,900 million board feet of sawtimber size and 15,300 million cubic feet of growing stock.[3] Approximately 51 percent of the sawtimber and 38 percent of the growing stock is located in the Western States of Alaska, Arizona, California,

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[3] Forest survey units (see footnote 2) define sawtimber size as volume found in trees of 11.0 inches diameter and up, and growing stock as volume of trees 5.0 inches and up diameter, International ¼ inch Log Rule.

Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, South Dakota, Utah, Washington, and Wyoming. Three of the foregoing States, Colorado, Utah, and New Mexico, contain 41 percent of the total sawtimber and 27 percent of the growing stock. About 38 percent of the sawtimber and 47 percent of the growing stock is located in the Lake States of Michigan, Minnesota and Wisconsin. The New England States of Maine, New Hampshire, Vermont, Massachusetts, Connecticut and Rhode Island contain about 5 percent of the sawtimber and 7 percent of the growing stock. The Middle Atlantic and Central States contain lesser amounts in that order.

PRODUCTION

Once classed as a "weed" or "inferior" species, aspen is now considered one of the Nation's major forest species, and is looked upon as having good potential for supplying much of the future timber resource needs. Its recent rise to prominence is due largely to developments in the fiber and particleboard fields, which can most effectively utilize the relatively small diameters typical of aspen.

Lumber

Lumber produced from aspen and cottonwood in the New England, Middle Atlantic, Western, and Lake States gradually increased from 1899 to mid-1960, but fluctuated widely (fig. 5).[4] The most noticeable increase was from approximately 77 million board feet in 1941 to a record 209 million board feet in 1955. Production since 1956 has tapered off, and varied considerably.

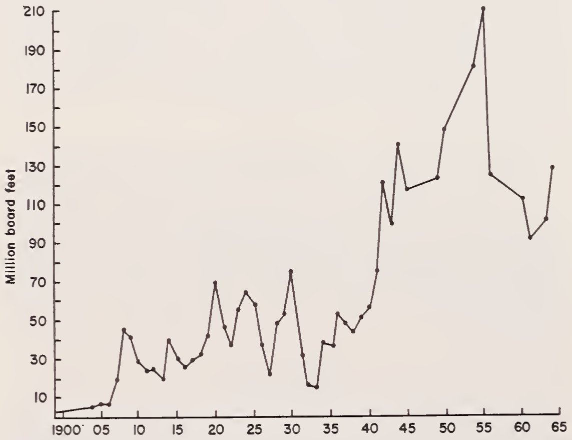

Figure 5.—Lumber produced in the New England, Middle Atlantic, Western, and Lake States from aspen and cottonwood, 1899–1964.

Pulpwood

The volume of aspen cut for pulpwood is considerably greater than that for lumber and other primary products. The total "poplar" pulpwood[5] consumed in the United States during selected years was:

Year	*Cords*
1931	487, 295
1937	531, 766
1947	881, 679
1954	1, 208, 134
1958	1, 376, 695
1963	1, 716, 520

Recently the Lake States have supplied the most aspen pulpwood; production rose from 94,000 cords during 1936 to over 2 million cords in 1966. Considerably less pulpwood was produced from aspen and related species in the Northeastern States: production varied from 58,000 cords in 1963 to 140,000 cords during 1967.[5]

CHARACTERISTICS AND PROPERTIES

The woods of quaking and bigtooth aspen are similar in appearance and properties. The heartwood is nearly white to light brown. The lighter colored and variable width sapwood generally blends gradually into the heartwood. Annual growth rings in seasoned wood are fairly distinct because color differs between the summerwood and the springwood of the succeeding year. Aspen wood generally is straight grained, and fine and uniformly textured. It resembles cottonwood, except that aspen is finer textured, lighter colored, and usually has narrower growth rings. Aspen has a characteristic odor when wet, but is odorless and tasteless when properly dried. It shrinks moderately, and can be air dried or kiln dried satisfactorily. If wetwood or pockets of high moisture content are present, however, the affected zones may collapse, check, or remain high in moisture after the normal drying schedule. The presence of tension wood may cause warpage.

Aspen is one of the softer and lighter-weight important commercial hardwoods of the United States, with specific gravity of 0.35, based on ovendry weight and green volume. Its average weight, airdry (12 percent moisture content), is 26 pounds per cubic foot. Because aspen wood is light, it has low strength. It is also moderately stiff, and is moderately low in shock resistance. It seldom splits when nailed, and has excellent nail-holding ability.

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[4] Individual estimates are not available for aspen and cottonwood. The term cottonwood generally refers to all *Populus* species other than quaking aspen and bigtooth aspen. Aspen generally refers only to quaking aspen and bigtooth aspen.

[5] Includes all *Populus* species. Amounts taken from Census of Manufacturers, U.S. Bur. Census, 1931, 1937, 1947, 1954, 1958, 1963. Census Bureau's designated areas include: Lake States—Michigan, Minnesota, Wisconsin; Northeastern States—Connecticut, Delaware, Kentucky, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia. Totals for 1963 and 1964 do not include Kentucky and Ohio. No estimates are available for the individual species.

PRINCIPAL USES

Pulp products such as book and specialty papers, newsprint, and insulation board consume the largest volume of aspen. Most aspen lumber is remanufactured into boxes, crating pallets, furniture parts, lumber core and interior trim, with a small volume being used for panel stock, match and core stock, excelsior, particleboard, paper roll plugs, and turned products. Its resistance to splitting when nailed, plus its light weight, its relatively high shock resistance for its light weight, and its freedom from odor make aspen an ideal container wood. These features, plus its uniform texture, and freedom from slivers also make it ideal for furniture parts and interior trim.

OTHER VALUES

Deer and elk commonly browse on aspen sprouts, leaves, and bark. Aspen buds are a major winter food source for members of the grouse family. The golden aspen foliage provides spectacular autumn scenery, especially throughout the western portion of its range.

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